Establishment of Russian Human Radiobiology Tissue Repository for the exposed Mayak PA workers

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The Russian Human Radiobiology Tissue Repository is being established at the Southern Ural Biophysics Institute, in Ozyorsk, Southern Urals in Russian Federation, supported jointly by the Russian Ministry of Health and the Office of Health Programs, U.S.DOE. It is hoped that this repository will serve as a resource to the radiobiology scientific community for current and future studies on the effects of chronic radiation exposure on human health.

The final inventory of archived tissues will include tissues from 700 deceased workers, employed from 1948 to 1972, at the first nuclear weapons facility "Mayak". In addition, donations of blood and buccal cells, and parts of tissue removed at the time of surgery and/or biopsy from the members of the Mayak cohort undergoing medical treatment or diagnostic procedures, will also be included (see Fig. 1 for the outline of the tissues in the Repository). To date 500 archived autopsies, which consist of formalin-preserved organs, paraffin blocks, and histology slides were inventoried (Table 1a/b and 2a/b). Of the 500 deceased workers, there were 242 diagnosed with malignant tumors, mainly of lung, stomach, liver, intestine cancers, and leukemia (Table 3). For all these cases occupational, dosimetric and the detailed medical information is available. Almost all the registrants of the Repository started their work at Mayak PA during the early years, at the time of highest radiation exposure (Fig. 2). For the inventoried 500 cases, the external gamma exposures are known for 96%, of whom 410 were exposed to protracted doses exceeding 0.5 Gy total, with known maximum annual doses ranging from 0.01 – 0.75 Gy for about 60% of the 500 cases (Fig. 3a and 3b, Fig. 4). Pu body burden is known for 70%. Of these, 144 individuals had exposures greater than 1.48 kBq, and 34 individuals, greater than 37 kBq (Table 4). The cause of death in almost half of the cases was malignant tumors. A computerized database of the Repository has been set up.

Collection and storage of newly obtained specimens (frozen lymphocytes, EBV-immortalized B-cells, frozen erythrocytes, extracted DNA, buccal cells and tumors at different sites) already includes donations from 95 individuals. More than 3,000 members of the 19,000 cohort of the workers employed from 1948 to 1972 are still residing in the city of Ozyorsk.

Members of the Russian team:

K.N.Muksinova,MSD–Principal Investigator
E.N. Kirillova, Ph.D. – hematologist
V.S. Revina – histologist
M.L. Zakharova – cytogenet
E.D. Drugova – radiobiologist
S.N. Sokolova – programmer
T.I. Uryadnitskaya – hematologist
V.L. Rybkina, Ph.D. – physician
O.V. Mamakova- pathologist

American team:

Ruth Neta, Ph.D. – Principal Investigator

Figure 1 - Description of Russian Human Radiobiology Tissue Repository

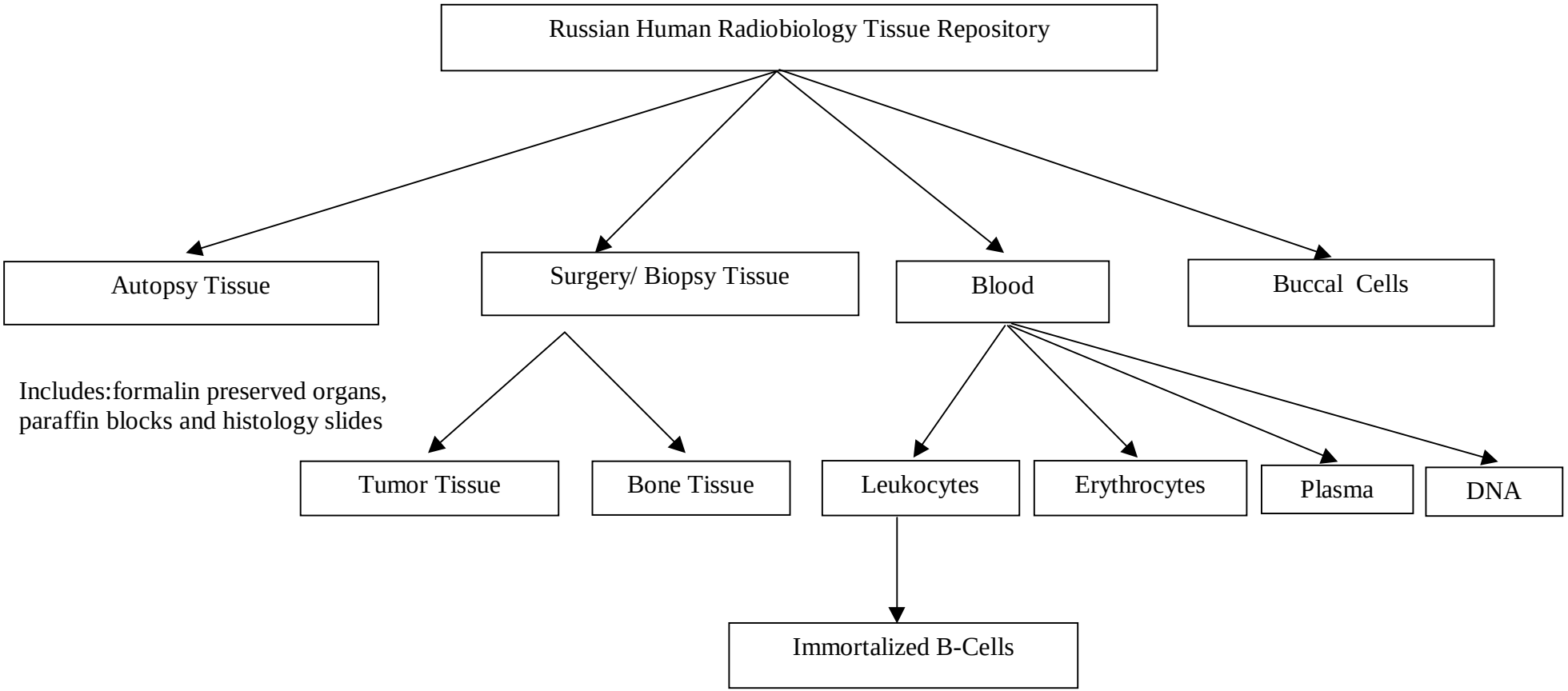


Table 1 - Results of the Inventory of Formalin-Fixed Tissues from 500 RHRTR Registrants

a/ Internal Organs

	Lung	Heart / Aorta	Stomach	Pancreas	Liver	Intestine		Kidneys	Urinary Bladder
						Small	Large		
Number of Cases	456	447 / 187	264	402	446	42	193	452	98

b/ Brain and Other Organs/Tissues

	Brain		Thyroid	Adrenal	Reproductive System				Lymphoid Tissue	
	Hemispheres	Cerebellum			Testes	Prostate	Ovaries	Uterus	Spleen	Lymph Nodes
Number of Cases	442	384	363	385	330	190	23	47	408	129

Table 2 - Results of the Inventory of Bone Samples[1] from 500 RHRTR Registrants

a/ Decalcified Bones[2]

	Sternum	Rib	Vertebra	Femur	Humerus	Cranium
Number of Cases	311	316	308	319	2	185

b/ Non-Decalcified Bones[3]

	Sternum	Rib	Vertebra	Femur	Humerus	Cranium
Number of Cases	54	81	54	66	1	18

[1] – there are both decalcified and non-decalcified bone samples from 103 cases;
[2] - samples are stored in alcohol;

[3] - samples are stored in formalin

Table 3 - Ouantity and Sites of Malignant Tumors Diagnosed in 242 (270* tumors) of 500 Registrants with Inventoried Archived Tissues

	Respiratory System		Digestive System					Hemopoietic/ Lymphoid Tissue		Bones	Skin	Urino-Genital System					Other
	Lung	Other	Stomach	Pancreas	Intestine	Liver	Other	Leukemia	Other			Testes	Prostate	Ovaries	Uterus	Kidneys	
Number of Tumors	101	4	34	11	12	17	6	28	6			1	9	1	1	9	
	105		80					34		7	10	21					13

Notes: * - primary-multiple tumors were diagnosed in 25 registrants (in 22 cases two tumors were observed per each case, in 3 ones three tumors were observed per each case)

Figure 3 – Dose Characteristics for 500 Registrants with Inventoried Archived Tissues

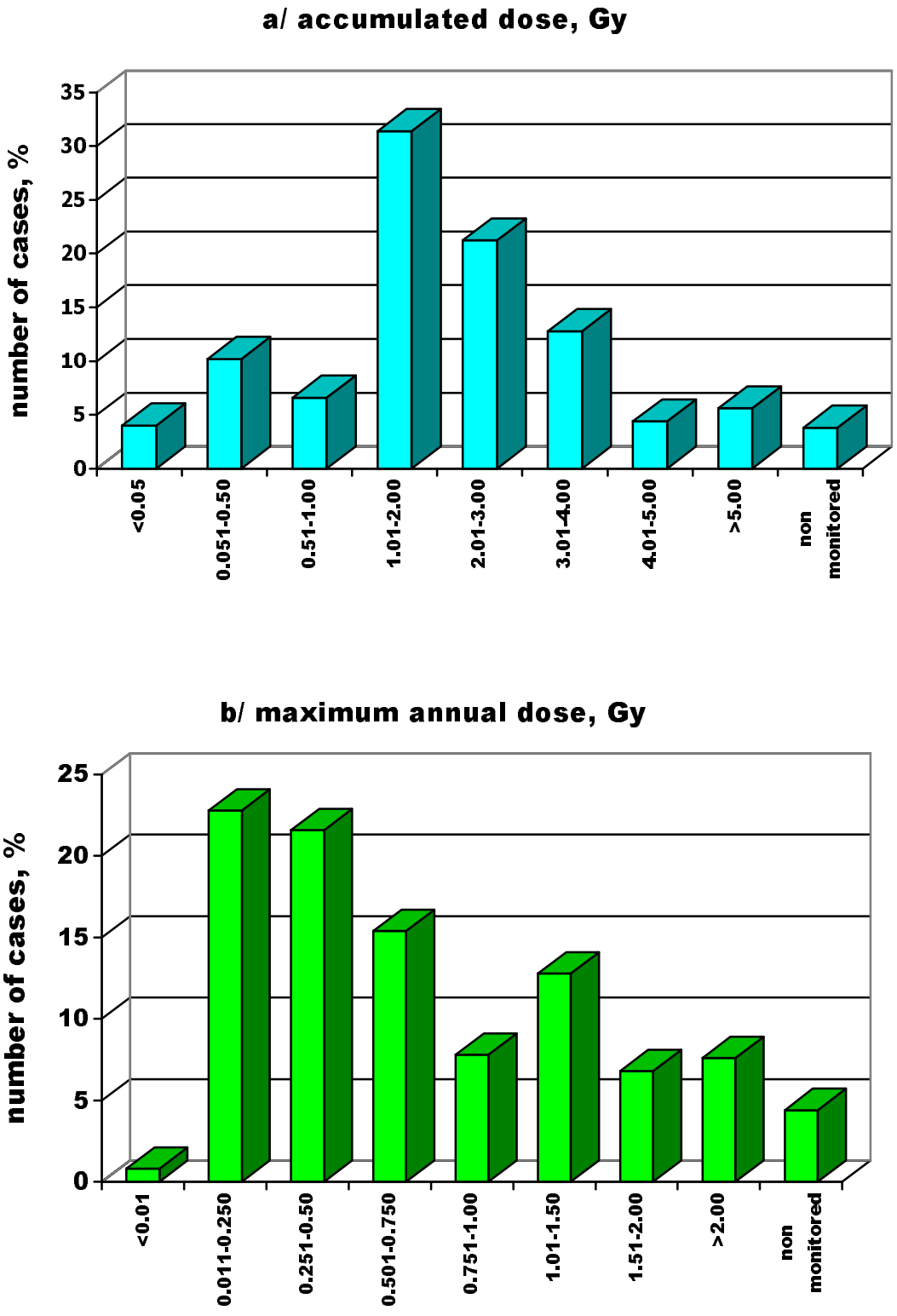


Figure 4 – Pu Body Burden for 500 Registrants with Inventoried Archived Tissues

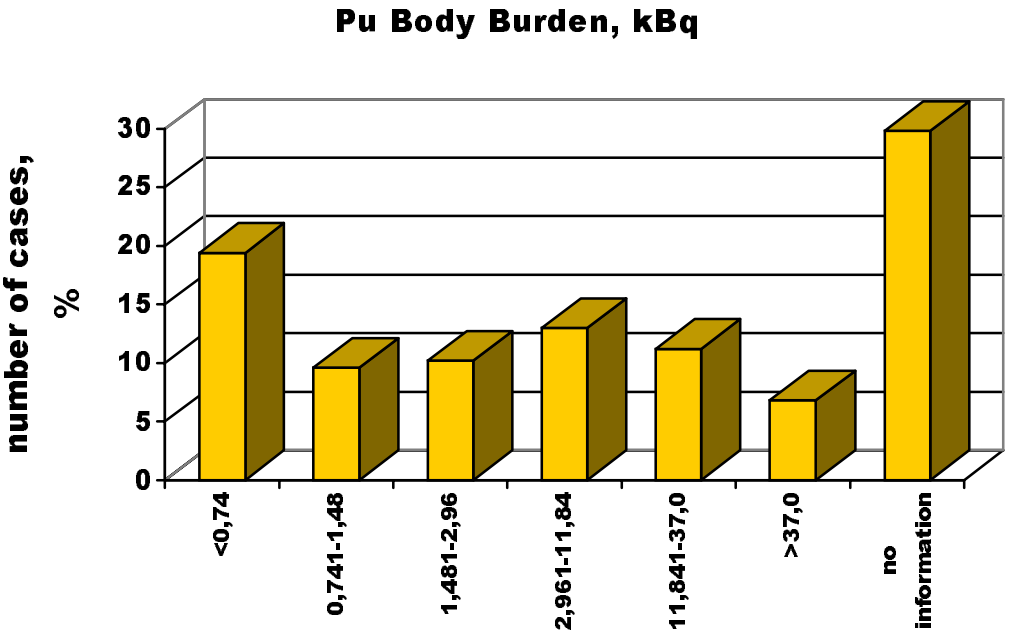


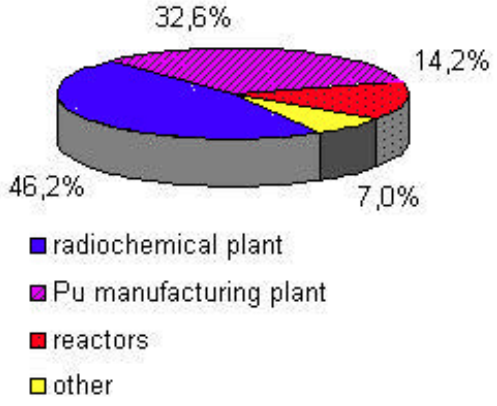
Table 4 - Data of Pu Body Burden (kBq) for 500 Registrants with Inventoried Archived Tissues

	< 0.74	0.741-1.48	1.481-2.96	2.961-11.84	11.841-37.0	> 37.0	No Information
Number of cases / %	97/19.4	48/9.6	51/10.2	65/13.0	56/11.2	34/6.8	149*/29.8

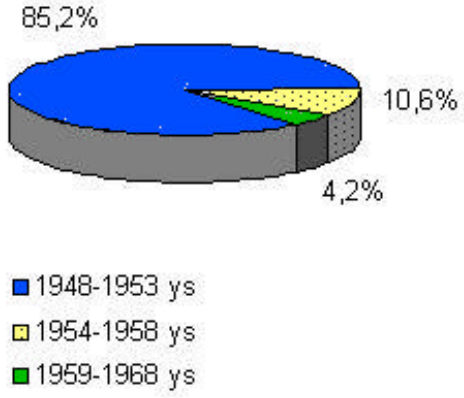
* - including reactor personnel

Figure 2 - Description of Donors with Inventoried Autopsy Tissues

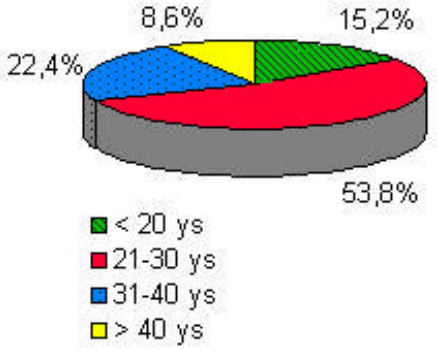
a/ plant type



b/ year at hire



c/ age at hire



d/ age at death year